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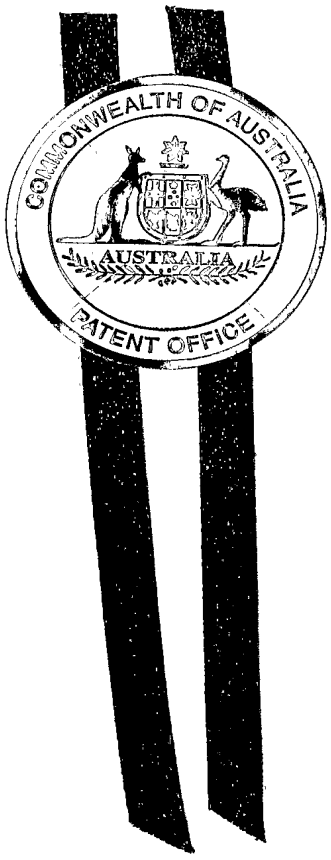

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Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

ANTONY LAWRENCE PIKE

Invention Title:

A SUPPORT FOR SUPPORTING A STRUCTURE ON A SURFACE

The invention is described in the following statement:

A SUPPORT FOR SUPPORTING A STRUCTURE ON A SURFACE

Field of the Invention

The present invention broadly relates to a support for supporting a structure on a surface. The present invention relates particularly, although not exclusively, to a support having at least two self-adjusting support elements.

Background of the Invention

Structures such as tables, ladders and tripods have legs for positioning on a surface. If not all of the legs contact the surface, the position of the structure will be instable. The position of the structure can be made more stable by adjusting the heights of individual legs. This is often done with a screw-type mechanism commonly found at the bottom of the legs.

Alternatively, all of the legs may be in contact with the surface but the structure may not have a desired orientation relative to the surface. Again, the position of the structure relative to the surface may be adjusted by adjusting the height of the individual legs with the same type of screw mechanism. Other structures such as large machines and houses may contact the ground directly without legs or through supporting beams or a base plate. Level or tilt adjustment of these large structures typically is done with individually controlled jacks or wedges.

In any case the adjustment of the position of the structure typically is cumbersome and time consuming. There is a need for a technically advanced solution.

Summary of the Invention

The present invention provides in a first aspect support for supporting support for supporting a structure on a surface, the support comprising at least one support element, the or each support element comprising:

a piston,

a cylinder in which the piston is moveable, and

a braking means for maintaining the piston in a position that is stable relative to the cylinder,

wherein the piston and the cylinder are arranged so that a loading associated with the structure effects an adjustment of the support element,

and wherein the loading associated with the structure activates the braking means if the moveability of a surface contact portion of the support element is reduced below a threshold value.

The or each cylinder typically has a fluid inlet/outlet and typically is arranged so that an amount of fluid flowing through the inlet/outlet controls the movement of the or each piston relative to the or each cylinder. The or each cylinder typically has an opening positioned so that in use the movement of the or each piston effects a movement of the surface contact portion of the or each support element relative to the surface.

The structure typically has at least two support elements. In this case the fluid inlet/outlets typically are interconnected by at least one fluid conduit so that the fluid can flow between the inlet/outlets. The support typically is arranged so that in use, when the support is placed on the surface and at least one of the surface contact portions does not contact the surface, a movement

of the pistons relative to the cylinders is effected that adjusts the positions of the surface contact portions relative to the surface.

The support typically is self-adjusting which has a significant practical advantage. For example, the structure with support may be placed on the surface and at least one of the surface contact portion may contact the surface while at least one other contact portion may not contact the surface. The surface may be uneven or the structure may be placed on the surface in an angled position. The structure typically is arranged so that the or each piston associated with the surface contact portion that contacts the surface moves inwardly and typically pushes fluid into the or each cylinders associated with the or each other contact portion that does not contact the surface which typically effects movement of each contact portion.

Alternatively, all contact portions may contact the surface but the structure may be tilted to a side such as the rear of the structure. In this case the loading on the or each rear support element would increase and the loading on the or each front support element would decrease. The structure typically is arranged so that the or each piston associated with the increased loading moves inwardly and typically pushes fluid into the or each cylinders associated with the or each support element associated with the decreased loading.

The support typically is arranged so that, after adjustment and if all contact portions contact the surface, the loading on the support elements actuates the braking means and inhibits movement of the pistons so that the structure is in an adjusted and stable position.

In one embodiment each piston comprises the surface contact portion arranged to contact the surface. Alternatively, the surface contact portion may be a component that is either in direct or indirect contact with the piston and that may be positioned so that a movement of the pistons relative to the cylinder effects a movement of the surface contact portions.

In a variation of this embodiment each cylinder may comprise a surface contact portion arranged to contact the surface. Alternatively, the surface contact portion may be a component that is either in direct or indirect contact with the cylinder and that may be positioned so that a movement of the cylinder relative to the pistons effects a movement of the surface contact portions.

In a specific embodiment the support is arranged so that the pistons move relative to the cylinders, until an increase of pressure in the cylinders actuates the braking means. For example, this may be the case when the pressure in all cylinders has the same level.

The braking means of each support element may be hydraulic. For example, the piston of each support element may have a cavity arranged so that in use fluid can penetrate from the inlet/outlet into the cylinder and into the cavity. In one specific embodiment of the present invention the piston is elongate and at least one side portion has at least one recess that is linked to the cavity. A brake-pad or brake-cylinder typically is positioned in the or each recess of the piston and arranged so that, if fluid penetrates into the cavity, the or each brake-pad or brake-cylinder is in use moved towards an interior wall of the cylinder. In this case the braking means typically is arranged so that an increase of the fluid pressure in the cavity increases the pressure of

the or each brake-pad or brake-cylinder against the interior wall of the cylinder and thereby acts against the moveability of the piston in the cylinder.

In a variation of this embodiment the cylinder may have at least one recess in an interior side wall. The or each brake pad or brake cylinder may be positioned in the or each recess of the interior side wall and arranged to push against the piston.

The braking means of each support element may also be mechanical. For example, the support element may comprise a brake potion which typically is moveable relative to the cylinder and with the piston until the movement of the surface contact portion is restricted, for example by contact withe the surface. For example, the brake portion may be the surface contact portion. In this case piston and brake portion may be arranged so that, when the movement of the brake portion is restricted, a further movement of the piston relative to the cylinder activates the braking means. For example, the braking means may be arranged so that a movement of the brake portion against an interior wall of the cylinder may be effected. In this case the piston and the braking means may have wedging portions which in use effect the movement of the brake portion against the interior wall of the cylinder. Further, the brake portion may have one or more teeth an exterior portion that are arranged to interlock with one or more teeth on the interior wall of the cylinder if the brake portion is pushed against the interior wall of the cylinder.

In one embodiment of the present invention the support comprises a reservoir for the fluid that is interconnected with the fluid inlet/outlets and that is in use typically positioned above the cylinders. The

cylinders, fluid inlet/outlets typically are connected so that a closed system in formed which may comprise the reservoir.

The support may also comprise a valve arranged to receive a hydraulic liquid. In this case the support typically is arranged so that, when the valve is opened and the hydraulic liquid is pumped into the support, the or each support element lift the structure from a first level to a second level.

For example, the structure may be a furniture item such as a table, building such as a house, or any other structure that may be placed on a surface. The structure typically has three or four support elements, but may alternatively have any number of support elements.

The present invention provides in a second aspect an adjustable support for supporting a structure on an underlying surface, the support comprising a piston cylinder assembly, the piston being moveable relative to the cylinder with one of the piston or cylinder being connected to, or forming part of, the structure and the other being associated with a contact portion operative to engage the underlying surface, and braking means for inhibiting movement of the piston relative to the cylinder, wherein the braking means is operative in response to the application of predetermined loading conditions to a portion of the support.

The braking means typically is operative in response to a threshold loading being applied to that portion of the piston cylinder assembly that is associated with the contact portion.

The invention will be more fully understood from the following description of specific embodiments of the invention. The description is provided with reference to the accompanying drawings.

Brief Description of the Drawings

Figures 1A and 1B show schematic representations of a support for a structure according to an embodiment of the present invention,

Figure 2 shows a support element for supporting a structure according to an embodiment of the present invention,

Figure 3 shows a support element for supporting a structure according to another embodiment of the present invention,

Figure 4 shows a support element for supporting a structure according to a further embodiment of the present invention and

Figure 5 shows a support element for supporting a structure according to yet another embodiment of the present invention.

Detailed Description of Specific Embodiments

Referring initially to Figures 1A and 1B, a support for a structure according to an embodiment of the present invention is now described. Figure 1A shows the support 10 supporting a structure 16. The support comprises in this embodiment 3 or 4 support elements and Figure 1A only shows two of the support elements. Each support element 12 and 14 comprises a cylinder 18 and a piston 20. The cylinders 18 have fluid inlet/outlets 22 which are connected by pipe 24. The cylinders are filled with a fluid so that the amount of the fluid that flows through

the inlet/outlets 22 determines the movement of the pistons 20 in the cylinders 18. As the fluid inlet/outlets are interconnected, an upward movement of one of the pistons in the respective cylinder effects a downward movement of the other cylinder.

The support is placed on surface 26 and the weight of the structure effects an upward movement of piston 20 in support element 14 and a downward movement of piston 20 in support element 12. The movements of the pistons therefore adjust the support elements 12 and 14. Once both pistons have reached the adjustment positions, the loading associated with the structure 16 effects a pressure increase within the cylinders and a brake (not shown) secures the pistons in the cylinders in the stationary position. As in this embodiment the adjustment and the securing of the pistons in the cylinders happens automatically, the support is self-adjusting.

The support 10 can also be used for a level adjustment. For example, the structure 16 may be a refrigerator supported by four support elements such as support element 12 and 14. If the refrigerator is tilted backwards, the pistons of the rear support elements move upwards and push hydraulic liquid into the cylinders of the front support elements and the pistons of the front support elements move in a downward direction. Once the refrigerator is released, the refrigerator will stay in the adjusted position and the weight of the refrigerator will effect brakes of each support element to engage the respective piston with the respective cylinder.

In this embodiment, the support 10 also includes a valve 25 arranged to receive a hydraulic liquid. When the valve 25 is open and the hydraulic liquid is pumped into the support 10, the pistons 20 of all support elements

move in a downward direction relative to the cylinders 18 and thereby lift the structure 16.

Figure 1B shows a variation of the embodiment shown in Figure 1A. In this case the structure that is supported by the support 26 is a table 26.

Figure 2 shows a support element 30 for supporting the structure, such as support element 12 or 14, in more detail. The support element 30 comprises a cylinder 32 in which a piston 34 is guided. The cylinder 32 has a fluid inlet/outlet opening 36 for receiving and ejecting fluid 38, such as a hydraulic liquid or water. The piston 34 has a seal 35 for sealing the fluid in the cylinder 32. The fluid inlet/outlet 36 is connected to another such fluid inlet/outlet of another support element (not shown). In this embodiment the piston 34 has a cavity 40 having openings 42 and 44 at the side portions of the piston 38. In the openings 42 and 44 brake cylinders 46 and 48 are guided and if the fluid pressure in the cylinder 38 is above a threshold level, the brake cylinders 46 and 48 are pushed against the interior wall of the cylinder 32 so as to position the piston 34 in a stationary position relative the cylinder 34. The cylinder 32 also has a thread 33 for mounting on a structure.

Typically, a structure, such as a table is supported by 3 or 4 of the support elements 30 which are interconnected. After placing the table on a surface, the support elements typically adjust for an uneven surface and fluid will flow between the cylinders until the pistons are in the adjustment position. The weight of the structure will increase the pressure above the threshold pressure and the brake cylinders 46 and 48 move against the interior wall of the cylinder 32 so as to position the pistons stationary. Consequently, the table would than

have a stable position.

Figure 3 shows a support element 50 for supporting a structure according to another embodiment of the invention. Again, the support element 50 may function as support element 12 or 14 in the embodiment shown in Figures 1A and 1B and described above. The support element 50 comprises a cylinder 52 in which a piston 54 is guided. The cylinder 52 has a fluid inlet/outlet opening 56 for receiving and ejecting fluid 58, such as a hydraulic liquid or water. The piston 54 has a seal 55 for sealing the fluid in the cylinder 52. The fluid inlet/outlet 56 is connected to another such fluid inlet/outlet of another support element (not shown). In this embodiment the support element 50 comprises another piston 60 positioned below the piston 54. The piston 54 has a cylindrical projection 62 which is received by a corresponding cylindrical bore 66 of the piston 60. The piston 60 has a cavity 68 which is filled with a hydraulic fluid 58 and which has openings 70 and 72. Brake cylinder 74 and 76 are guided in the openings 70 and 72 and if the fluid pressure in the cavity 68 is above a threshold level, the brake cylinders 74 and 76 are pushed against the interior wall of the cylinder 52 so as to position the piston 60, and thereby the piston 54, in a stationary position relative the cylinder 52. The cylinder 32 also has a thread 77 for mounting on a structure.

Further, the support element 50 comprises a compression spring 79 positioned around the projection 62. When the structure is lifted and therefore the loading on the support element is reduced, the spring 79 functions to push the pistons 54 and 60 apart from one another and thereby reduces the pressure of the fluid in the cavity 68. As a consequence, a back-movement of the brake

cylinders 74 and 76 is supported.

Figure 4 shows a support element 80 for supporting a structure according to a further embodiment of the invention. Again, the support element 80 may function as support element 12 or 14 in the embodiment shown in Figures 1A and 1B and described above. The support element 80 comprises a cylinder 82 in which a piston 84 is guided. The cylinder 82 has a fluid inlet/outlet opening 86 for receiving and ejecting fluid 88, such as a hydraulic liquid or water. The piston 84 has a seal 85 for sealing the fluid in the cylinder 82. The fluid inlet/outlet 86 is connected to another such fluid inlet/outlet of another support element (not shown). In this embodiment the support element 80 comprises another piston 90 positioned below the piston 84. The piston 84 has a cylindrical projection 92 which is positioned in a recess 96 of the piston 90.

The piston 90 has a ring-portion 98 which is composed of an elastic material such as a rubber-like material and the projection 92 of the piston 84 has a wedge portion 100. In this embodiment the piston 90 has a surface contact portion 102 and when the support element 80 is in an adjusted position after movement of the piston 84 relative to the cylinder 82, the surface contact portion contacts the surface and the movement of the piston 90 is restricted. The weight of the structure effects a further movement of the piston 84 in a downward direction against the piston 90 and the wedge portion 100 wedges the elastic ring-like portion 98 against the interior wall of the cylinder 82 and thereby inhibits further movement of the pistons 90 and 84 in the cylinder 82.

Figure 5 shows a support element 110 for supporting a structure according to a yet another embodiment of the

invention. Again, the support element 110 may function as support element 12 or 14 in the embodiment shown in Figures 1A and 1B and described above. The support element 110 comprises a cylinder 122 in which a piston 114 is guided. The cylinder 112 has a fluid inlet/outlet opening (not shown) for receiving and ejecting fluid 118, such as a hydraulic liquid or water. The piston 114 has a seal 115 for sealing the fluid in the cylinder 112. The fluid inlet/outlet is connected to another such fluid inlet/outlet of another support element (not shown). In this embodiment the support element 110 comprises a surface contact portion 120 which is positioned below the piston 114 and around projection 122 of the piston 114.

The projection 122 has wedge-shaped side projections 124 and the surface contact portion 120 has wedge-shaped recesses 126. In this embodiment, the surface contact portion comprises two parts 120 a and 120 b. When the support element 110 is in an adjusted potion after movement of the piston 114 relative to the cylinder 112, the surface contact portion 120 contacts the surface and the movement of the surface contact portion therefore is restricted. The weight of the structure effects a further movement of the piston 114 in a downward direction against the surface contact portion 120 and the wedge portions 122 move parts 120 A and 120b apart from one another and towards the interior wall of the cylinder 112. In this embodiment, the lower part of the interior wall of the cylinder 112 has at least one tooth 128 on the surface and the parts 120 A and 120 B have toothed surfaces 130. When the parts 120 A and 120 B are moved towards the interior side wall of the cylinder 112, the teeth 128 engage with the toothed surface 130 and the engagement inhibits further movement of the piston 118 and the surface contact

portion 120.

In the embodiment discussed above the cylinder and pistons are composed of a metallic material such as aluminium or steel. Alternatively, the pistons and cylinders may also be composed of a suitable plastics material. The inlet/outlets of the support elements typically are interconnected using a suitable rubber hose, but may also be interconnected using a plastics or metallic hose. The internal diameter of the hose and also additional valves may be used to control the throughput of the hydraulic liquid through the hose and therefore the sensitivity (reaction speed) of the support for adjusting for changed loading conditions. The inlet/outlets may also be interconnect via a reservoir.

Although the invention has been described with reference to particular examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms. For example, the cylinder of each support element may comprise braking means that has parts which move against a side portion of the piston. Further, the cylinder of each support element may comprise a surface contact portion and the piston may be arranged to be connected to the structure. In addition, it is to be appreciated that the pistons and cylinders may be composed of any suitable material and may be of any suitable shape.

Further, the support may only comprise one support element. For example, the support may be a single supporting member, such as a prop for supporting a building structure, which is compressible and has a braking means which engage above a predetermined loading so that the supporting member can support the structure.

The Claims defining the Invention are as Follows:

1. A support for supporting a structure on a surface, the support comprising at least one support element, the or each support element comprising:

a piston,

a cylinder in which the piston is moveable, and

a braking means for maintaining the piston in a position that is stable relative to the cylinder,

wherein the piston and the cylinder are arranged so that a loading associated with the structure effects an adjustment of the support element,

and wherein the loading associated with the structure activates the braking means if the moveability of a surface contact portion of the support element is reduced below a threshold value.

2. The support as claimed in claim 1 wherein the cylinder has a fluid inlet/outlet and is arranged so that an amount of fluid flowing through the or each inlet/outlet controls the movement of the or each piston relative to the or each cylinder.

3. The support as claimed in claim 2 wherein the or each cylinder has an opening positioned so that in use the movement of the or each piston effects a movement of the surface contact portion of the or each support element relative to the surface.

4. The support as claimed in claim 3 comprising at least two support elements and wherein the fluid inlet/outlets are interconnected by at least one fluid conduit so that the fluid can flow between the inlet/outlets.

5. The support as claimed in claim 4 being arranged so that in use, when the support is placed on the surface and at least one of the surface contact portions does not contact the surface, a movement of the pistons relative to the cylinders is effected that adjusts the positions of the surface contact portions relative to the surface.

6. The support as claimed in claim 5 wherein each piston comprises the surface contact portion arranged to contact the surface.

7. The support as claimed in claim 5 wherein the surface contact portion is a component that is either in direct or indirect contact with the piston.

8. The support as claimed in any one of claims 5 to 7 being arranged so that the pistons move relative to the cylinders, until an increase of pressure in the cylinders actuates the braking means.

9. The support as claimed in any one of claims 5 to 7 wherein the braking means of each support element is hydraulic.

10. The support of claim 9 wherein the piston of each support element has a cavity arranged so that in use fluid can penetrate from the inlet/outlet into the cylinder and into the cavity.

11. The support as claimed in claim 10 wherein the piston of each support element is elongate and at least one side

portion has at least one recess that is linked to the cavity.

12. The support as claimed in claim 11 wherein a brake-pad or brake-cylinder is positioned in the or each recess of the piston and arranged so that if fluid penetrates into the cavity the or each brake-pad or brake-cylinder is in use moved towards an interior wall of the cylinder.

13. The support as claimed in claim 12 wherein the braking means is arranged so that an increase of the fluid pressure in the cavity increases the pressure of the or each brake-pad or brake-cylinder against the interior wall of the cylinder and thereby acts against the moveability of the piston in the cylinder.

14. The support as claimed in claim 9 wherein the cylinder has at least one recess in an interior side wall and at least brake pad or brake cylinder is positioned in the or each recess of the interior side wall and arranged to push against the piston.

15. The support as claimed in any one of claims 5 to 8 wherein the braking means of each support element is mechanic.

16. The support as claimed in claim 15 comprising a brake potion which is moveable relative to the cylinder and with the piston until the movement of the surface contact portion is restricted.

17. The support as claimed in claim 15 wherein the brake portion is arranged so that, when the movement of the

brake portion is restricted, a further movement of the piston relative to the cylinder activates the braking means.

18. The support of claim 17 wherein the braking means has wedging portions which in use effect a movement of the brake portion against an interior wall of the cylinder.

19. The structure as claimed in any one of the preceding claims having three support elements.

20. The structure as claimed in any one of claims 1 to 18 having four support elements.

21. The structure as claimed in any one of the preceding claims wherein the structure is a furniture item.

22. The structure as claimed in any one of the preceding claims wherein the structure is a table.

23. An adjustable support for supporting a structure on an underlying surface, the support comprising a piston cylinder assembly, the piston being moveable relative to the cylinder with one of the piston or cylinder being connected to, or forming part of, the structure and the other being associated with a contact portion operative to engage the underlying surface, and braking means for inhibiting movement of the piston relative to the cylinder, wherein the braking means is operative in response to the application of predetermined loading conditions to a portion of the support.

24. An adjustable support according to claim 1 wherein the braking means is operative in response to a threshold loading being applied to that portion of the piston cylinder assembly that is associated with the contact portion.

DATED this 16th day of AUGUST 2004
ANTONY LAWRENCE PIKE
By his Patent Attorneys
GRIFFITH HACK

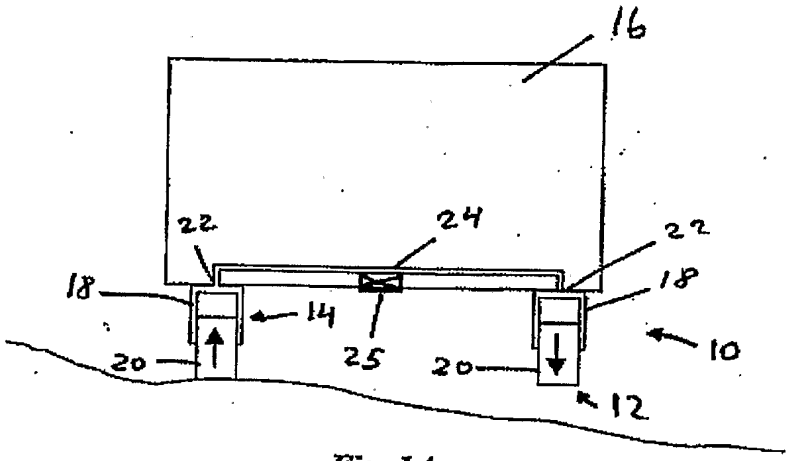

Fig. 1A

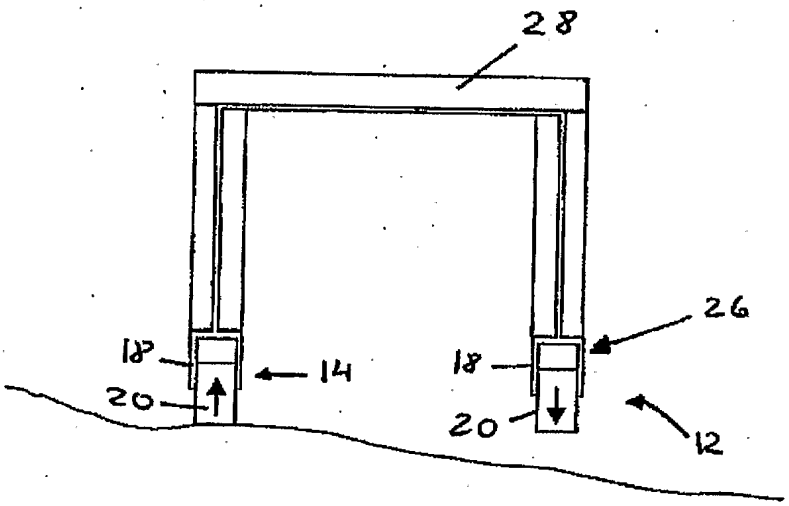

Fig. 1B

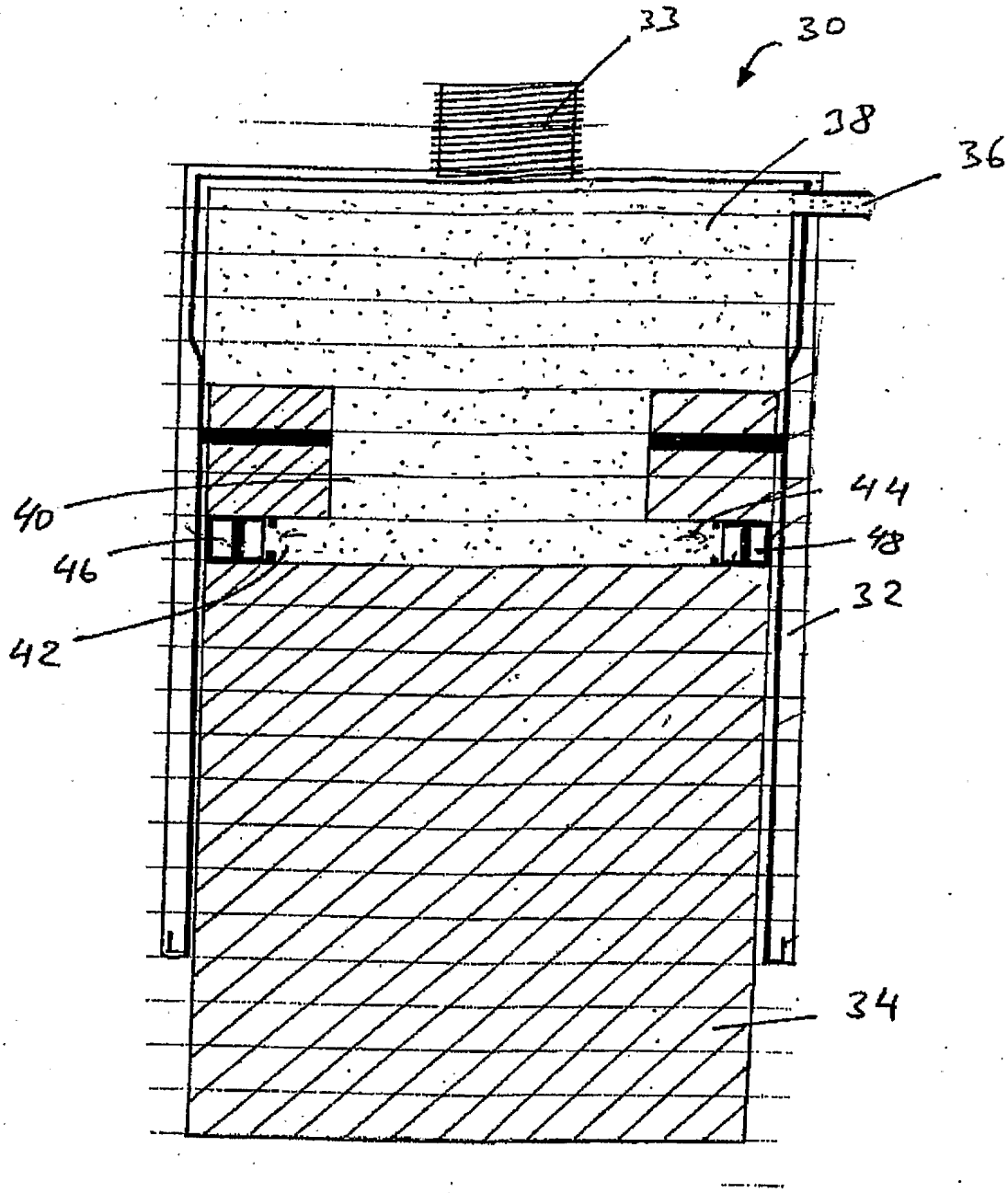

FIG. 2

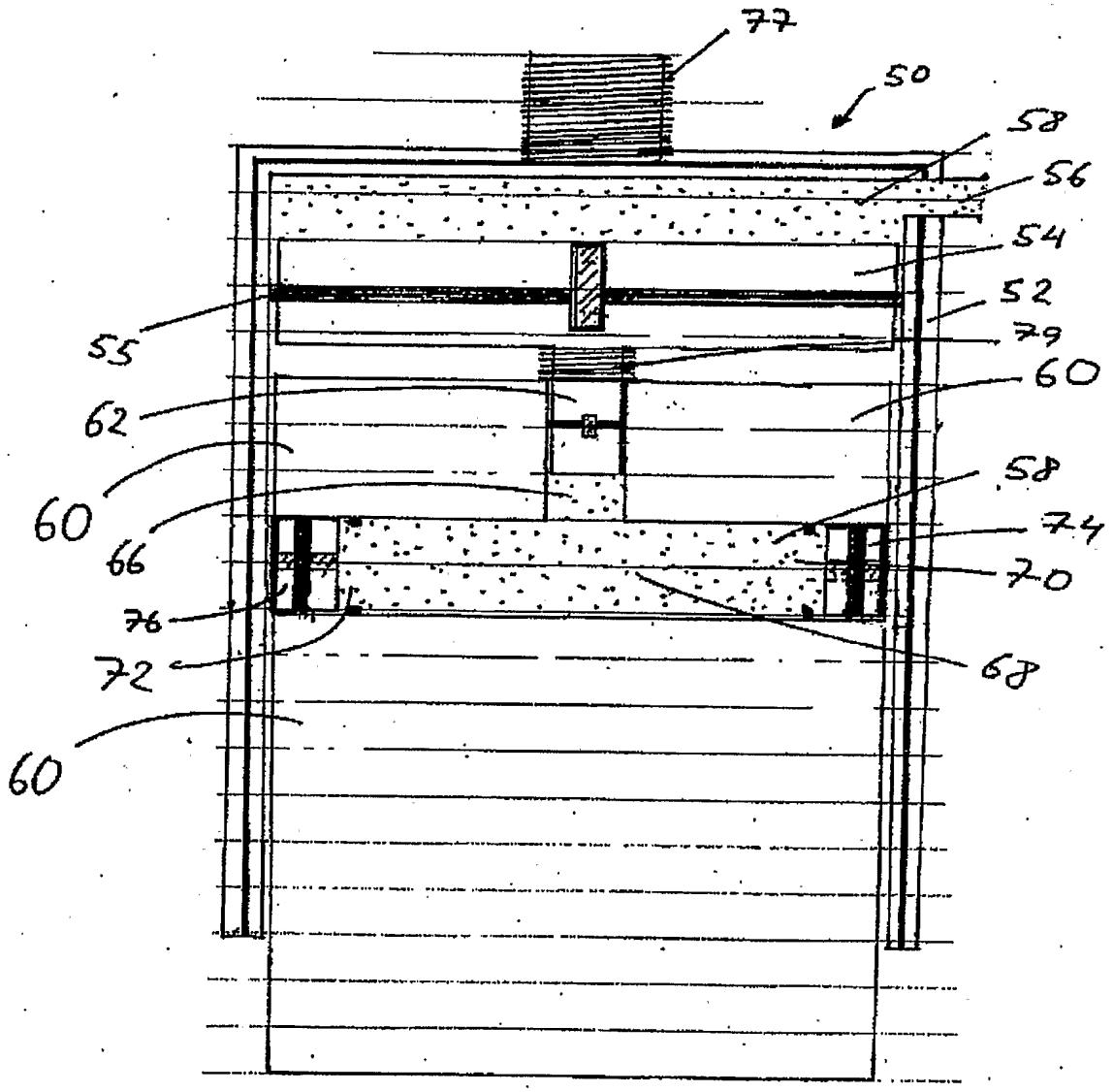

FIG. 3

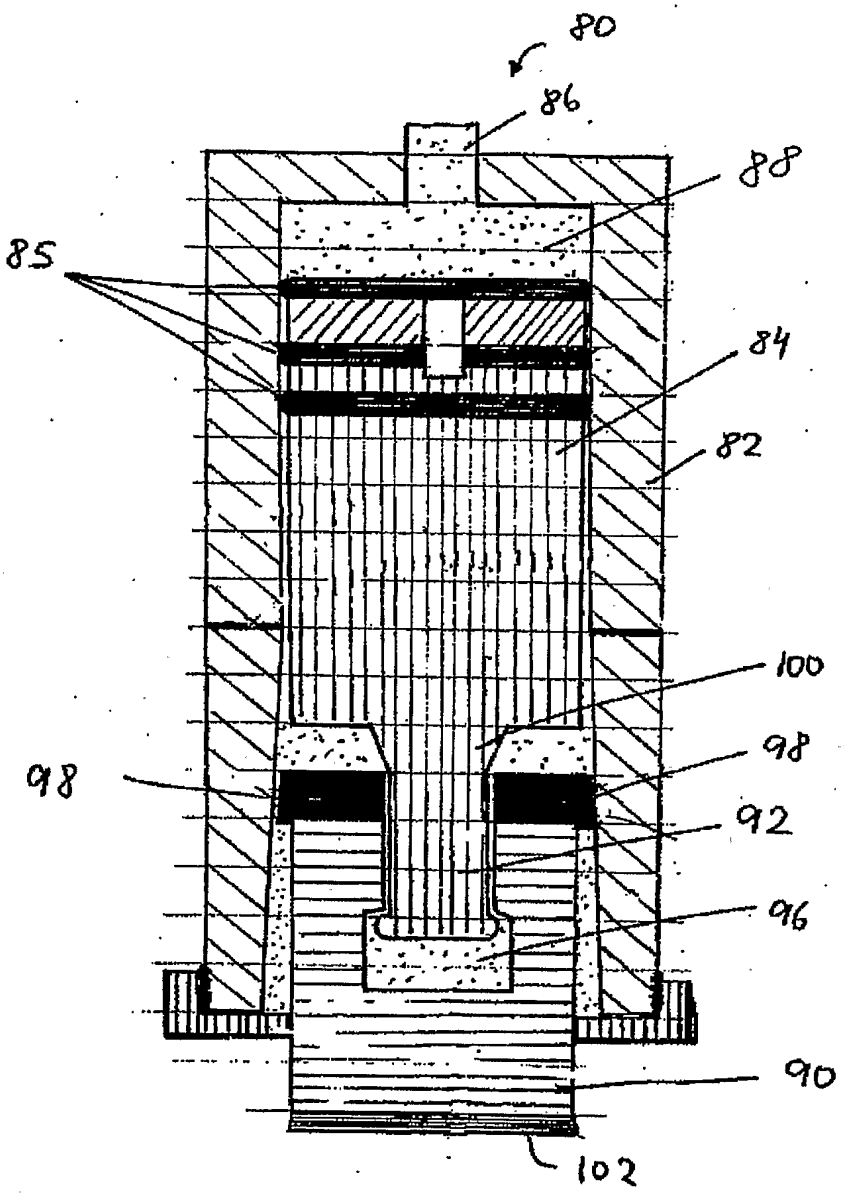

FIG. 4

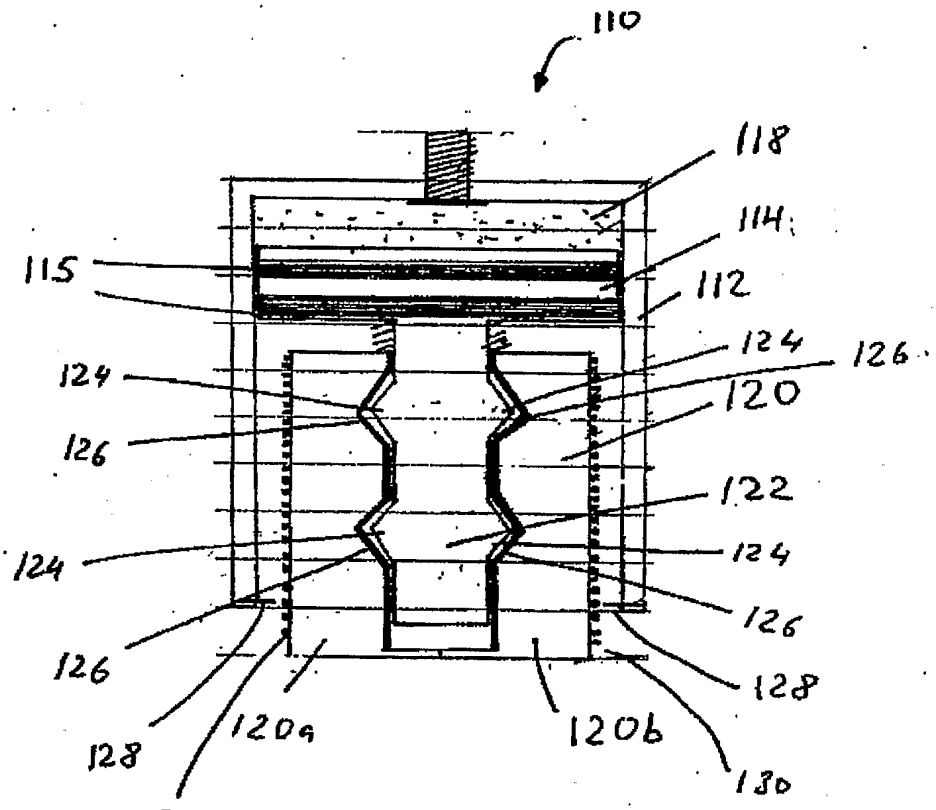
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FIG. 5